

ROOTALA ROTUNDIFOLIA (LYTHRACEAE) NEW TO FLORIDA

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ABSTRACT

Naturalized populations of the Asian amphibious species *Rotala rotundifolia* are documented for three peninsular Florida counties. Distinguishing characters and a comment on invasive potential are also provided.

RESUMEN

Se documentan las poblaciones naturalizadas de la especie Asiática anfibia *Rotala rotundifolia* para tres condados de Florida peninsular. Se presentan también caracteres distintivos y un comentario acerca del potencial de invasión.

Rotala rotundifolia (Buch.-Ham. ex Roxb.) Koehne is a creeping amphibious perennial found mostly in mountainous areas across a broad native range extending from India to Japan and China (Cook 1979; TROPICOS 2003). It has been widely available in the international aquarium trade for more than three decades (e.g., Roe 1967; Stodola 1967) and more recently promoted in the water garden trade (e.g., Schuck 2000). "Dwarf Rotala," as it is often called in the trade, was first collected in Florida as an established escape in 1996 by the second author while consulting with water managers in the City of Coral Springs, Broward County in southeast Florida. A robust stand was spreading along the edge of a flood-control canal coursing through a residential area. Samples of naturalized populations have since been collected from a second canal location in Coral Springs, a flood-control canal in Palm Beach County to the north, and flood-control canals in the community of Lehigh Acres, Lee County in southwest Florida (Fig. 1).

Representative specimens: **FLORIDA. Broward Co.:** Coral Springs, one block N of Sample Road, in and along edge of canal about 46 m E of the intersection of Cardinal Road (NW 40th Street) and Woodside Drive, N26.2793 W80.2285, 8 Mar 1996, Vandiver s.n. (FLAS); Coral Springs, in and along

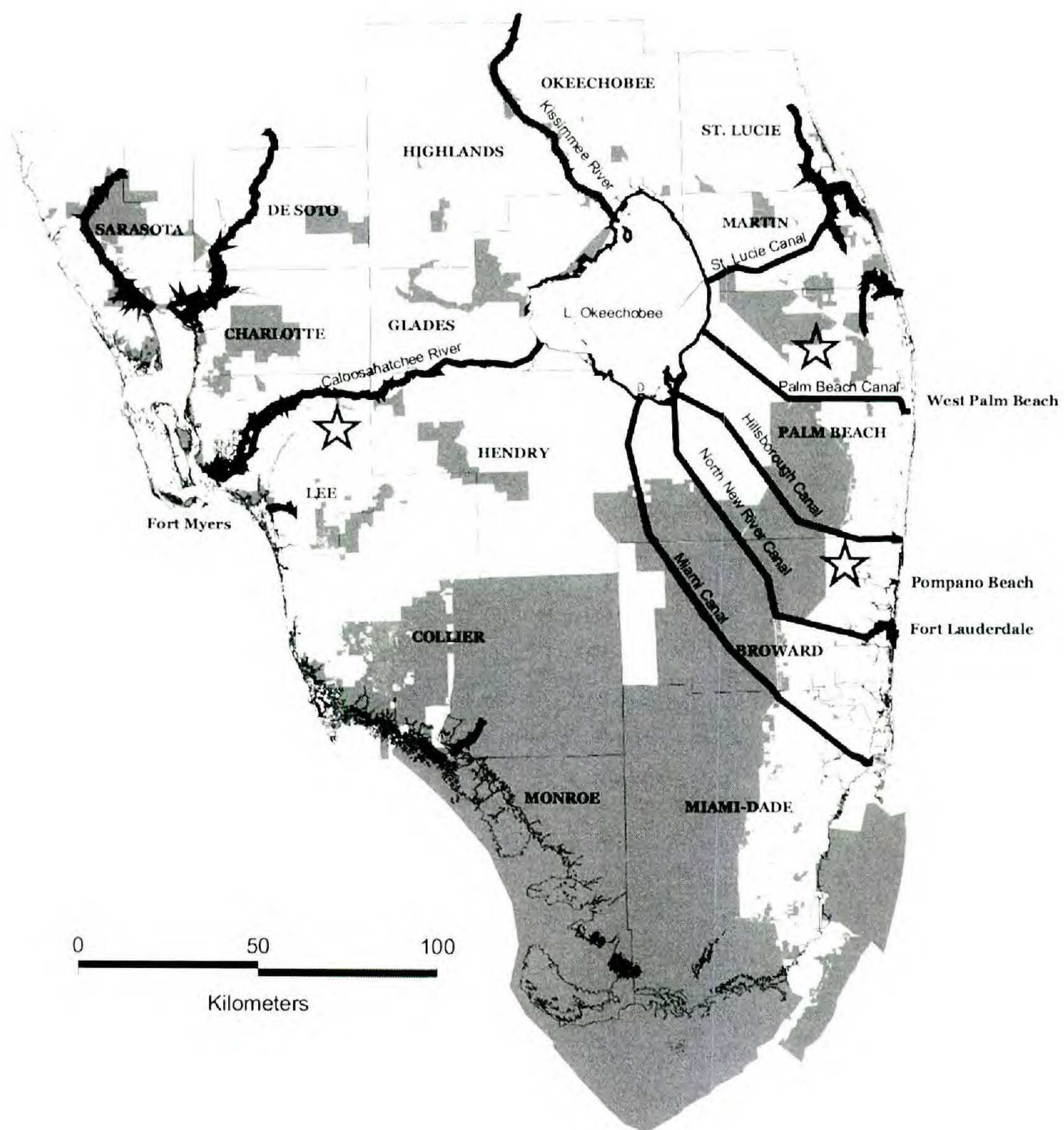


FIG. 1. Florida distribution of *Rotala rotundifolia* (stars). Each star marks two or more populations within a particular canal system (see text). Gray areas delineate public conservation lands (federal, state, local, and non-governmental).

W bank of canal on E side of Cypress Park, E side of Coral Springs Drive, 0.5 km S of Ramblewood Drive, N26.2476 W80.2662, 4 Apr 2000, *Vandiver s.n.* (FLAS, NY, SWSL, USF). **Lee Co.:** Lehigh Acres, S bank and shallows of Able Canal, N26.6118 W81.6412, 12 Apr 2002, *Jacono 418* (FLAS); 10 Jun 2002, *Burks 1215* (FLAS, FSU, FTG, USF). **Palm Beach Co.:** Indian Trail Improvement District, N of Loxahatchee and Lion Country Safari, Development Unit 5, two blocks S of North Lake Boulevard (CR-809A), in floating mats by culvert at the intersection of Hamlin Boulevard and District's "L" Canal (formerly 170th Avenue), N26.8089 W80.3114, 12 Jun 2001, *Vandiver s.n.* (FLAS, USF, Z).

Additional small patches or mats were noted in connecting canals of the Indian Trail system, Palm Beach County. A June 2002 survey of the Lehigh Acres canal system, Lee County, revealed additional patches at the junction of Charlie Diversion and Hickey Creek Canals (N26.6435 W81.6626) and on the east side of Harns Marsh, a filtration impoundment (N26.6520 W81.6872); none was

found at the outfall to the Orange River, a natural waterway that is part of the Caloosahatchee River basin. In North America, the species is known from just one other point of introduction—Tuscaloosa, Alabama, where it is well established around a campus pond (Haynes 2002, 2003 pers. comm.).

Only two congeners of this species are known to occur in the continental United States and Canada: the widespread native “toothcup,” *Rotala ramosior* (L.) Koehne, and another introduced Asian species, *Rotala indica* (Willd.) Koehne, which is known from rice field edges in Butte County, California (Mason 1957; Oswald 1994) and in five parishes of Louisiana (Thieret 1972 [Thieret 33544, 1972, FLAS! FSU!]; R. D. Thomas [NLU] 2000 pers. comm.). All three species are low growing, glabrous herbs found in or near water; the leaves are decussate or rarely in whorls of three. *Rotala rotundifolia* (Fig. 2) is easily distinguished by a usually perennial habit; emerged leaves obovate to orbicular, to 2 cm long and 2.5 cm wide; a conspicuous rose-pink inflorescence of small spike-like racemes that elongate and become lax in post-anthesis; and 4-valved capsules (Cook 1979, 1990; Graham 1975; Reed 1977).

In the water-plant trade, *R. rotundifolia* has sometimes been confused with *R. indica* (e.g., Schuck 2000) and with an endemic of southwest India, *Rotala macrandra* Koehne (see discussion in Benl 1972). The annual *R. indica* has leaves with distinct cartilaginous margins, solitary flowers or short lateral spikes in upper leaf axils, calyx tubes longer than broad, and 2-valved capsules (Cook 1979). The Indian plant *R. macrandra* is much like *R. rotundifolia* in form and habit, but its submersed leaves are usually longer, to 2.5 cm, with their bases remaining more rounded (Rataj & Horeman 1977). Also, *R. macrandra*’s spike-like racemes usually remain dense in fruit, not elongated, and its stamens and styles are long exserted from the calyx tube (Cook 1979).

Presently, the naturalized populations of *Rotala rotundifolia* on Florida’s east coast are much reduced in size—though not entirely eradicated—having responded well to routine tools of chemical control for aquatic plants that may impede water flow in these canal systems. Aquatic-label glyphosate and the aquatic-granular form of 2,4-dichlorophenoxyacetic acid have proven to be the most successful herbicides in stopping the spread of plants (2003 pers. comm., T. Narrow, N. Sculy). Multiple tools are used in the canals, including sterile triploid grass carp, or white amur (*Ctenopharyngodon idella* (Valenciennes)), as a biocontrol agent. However, these herbivorous fish apparently are not inclined to eat this species; they have been observed nibbling at submersed foliage of *R. rotundifolia* and immediately spitting it out (2003 pers. comm., T. Narrow).

On the west coast in the Lehigh Acres system, the current situation is less encouraging, with significant spread of shoreline patches and floating mats in the canals (2003 pers. comm., K. Waugh). However, managers are trying different tools and continuing to check for plants at the outfall water gates.

Florida’s widely separated populations no doubt represent multiple intro-



FIG. 2. *Rotala rotundifolia*, in cultivation at quarantine research garden, Tallahassee, Florida. **a.** Orbicular leaves and spike-like racemes. **b.** Submersed leaves, light green, decussate. Growing in a concrete vat with native marsh plants, this species has competed well and overwintered here for at least 15 years, with occasional spread to damp graveled ground between vats (by fallen stem fragments). Cultivation vouchered by *Hall 1842, 1988 (FLAS)* and *Anderson 15431, 1995 (FSU)*.

ductions, most likely by dumping of unwanted aquarium or water-garden material. Within each canal system, the plants have probably spread by floating stem fragments, which root adventitiously at lower nodes. Seeds have been observed in collected plant samples, but their levels of viability and germination under Florida conditions are not known. Cook (1979) considered this species self-incompatible and insect-pollinated based on his cultivation studies.

The proximity of natural waterways and wetland conservation lands to the canal systems (Fig. 1) calls for close monitoring to prevent inadvertent transport of viable stem fragments, and possibly seeds, to natural habitats. More educational effort is also needed to revise the age-old human habit of inappropriate disposal of unwanted goods.

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REFERENCES

- BENL, A.V.G. 1972. *Rotala macrandra* Koehne (Lythraceae). Die Aquarien- und Terrarien-Zeitschrift (Stuttgart) 25:198–201.
- COOK, C.D.K. 1979. A revision of the genus *Rotala* (Lythraceae). Boissiera 29:1–156.
- COOK, C.D.K. 1990. Aquatic plant book. SPB Academic Publishing, The Hague.
- GRAHAM, S.A. 1975. Taxonomy of the Lythraceae in the southeastern United States. Sida 6:80–103.
- HAYNES, R.R. 2002. Noteworthy collections: Alabama, *Rotala rotundifolia*. Castanea 67:216.
- MASON, H.L. 1957. A flora of the marshes of California. Univ. of California Press, Los Angeles (1969 Reprint).
- OSWALD, V. 1994. Manual of the vascular plants of Butte County, California. California Native Plant Society, Sacramento.
- RATAJ, K. and T.J. HOREMAN. 1977. Aquarium plants. T.F.H. Publications, Neptune City, New Jersey.
- REED, C.F. 1977. Economically important foreign weeds. Agric. Handbook 498. Agric. Research Service, U.S. Dept. of Agric., Washington, D.C.
- ROE, C. D. 1967. A manual of aquarium plants. Shirley Aquatics Ltd., Shirley, Solihull, England.
- SCHUCK, S. 2000. Accent on aquatics: *Rotala rotundifolia*. Pondkeeper 6:40–41.
- STODOLA, J. 1967. Encyclopedia of water plants. T.F.H. Publications, Jersey City, New Jersey.
- THIERET, J.W. 1972. *Rotala indica* (Lythraceae) in Louisiana. Sida 5:45.
- TROPICOS. 2003. VAScular TROPICOS occurrence database. W³TROPICOS, Rev. 1.5. Missouri Botanical Garden. <http://mobot.mobot.org/W3T/search/vast.html> (accessed July 13, 2003).